CLAIMS

1.   A simulation apparatus for a communication
system, for carrying out tests for protocol messages
in communication with a communication terminal to
5   be evaluated by transmitting test signals to the
communication terminal to be evaluated, and receiving
response signals from the communication terminal to
be evaluated, comprising:

a definition file in which a convention including
10   a definition regulated with respect to a configuration
of nodes which are information elements of protocol
messages in communication with the communication
terminal to be evaluated has been described;

an interface library including an application
15   program interface which can provide and receive
operational information with respect to the nodes of
the protocol messages to and from an exterior section;

a memory managing section which manages various
data relating to the nodes of the protocol messages;

20   a decode processing section which specifies a
data region and a value of data allocated to each
node in the protocol messages by processing to decode
the protocol messages along the definition regulated
in the definition file and in accordance with the
25   operational information from the exterior section
to the interface library, and which delivers data of
each node corresponding to the protocol messages to

the memory managing section; and

an encode processing section which generates a desired protocol message by combining the data relating to the nodes of the protocol messages managed at the memory managing section, along the definition regulated in the definition file and in accordance with the operational information from the exterior section to the interface library.

2. A simulation apparatus for a communication system according to claim 1, characterized in that

the decode processing section processes to decode the protocol messages input via the interface library, prepares a message tree showing a relationship of a hierarchy of each node of the protocol messages based on the definition regulated in the definition file and outputs the message tree to the memory managing section, and detects data of an arbitrary node denoted by a path which has been designated from among the data relating to the nodes of the protocol messages managed at the memory managing section based on a path denoting a node at which there is desired data, which is designated via the interface library.

3. A simulation apparatus for a communication system according to claim 1, characterized by further comprising:

a scenario executing section which stores an executable format scenario in which a sequence

for executing transmission in a desired protocol
message to the communication terminal to be evaluated
and reception in the desired protocol message from
the communication terminal to be evaluated has

5   been described, and which outputs at least a receive
protocol message received from the communication
terminal to be evaluated to the interface library by
executing the executable format scenario in accordance
with the sequence described in the executable format

10   scenario;

a trace data managing section which manages the
sequence of the desired protocol message executed at
the scenario executing section; and

a first display control section which carries

15   out control for causing to display the sequence of
the desired protocol message managed at the trace data
managing section onto a display section.

4.   A simulation apparatus for a communication
system according to claim 3, characterized in that

20   the decode processing section processes to decode
the protocol messages input via the interface library,
prepares a message tree showing a relationship of a
hierarchy of each node of the protocol messages based
on the definition regulated in the definition file

25   and outputs the message tree to the memory managing
section, and detects data of an arbitrary node denoted
by a path designated from among the data relating

to the nodes of the protocol messages managed at the memory managing section based on a path denoting a node at which there is desired data, which is designated via the interface library.

5   5. A simulation apparatus for a communication system according to claim 1, characterized by further comprising:

an encode and decode editing section which has a user interface to receive an editing operation in each

10   section of node of a desired protocol message via the interface library, and which edits the desired protocol message;

a second display control section which carries out control for causing to display onto the display section

15   contents of the editing operation in each section of node of the desired protocol message received by the user interface of the encode and decode editing section; and

a descriptive format scenario storage section

20   which stores a descriptive format scenario described as a sequence for transmitting and receiving the desired protocol message edited at the encode and decode editing section.

6. A simulation apparatus for a communication

25   system according to claim 5, characterized in that

the decode processing section processes to decode the desired protocol message, prepares a message tree

showing a relationship of a hierarchy of each node of

the desired protocol message based on the definition

regulated in the definition file, causes to display

the message tree onto the display section via the

5   second display control section, and outputs it to the

memory managing section to thereby detect data of an

arbitrary node denoted by a path designated from among

the data relating to the nodes of the desired protocol

message managed at the memory managing section based on

10   a path denoting a node at which there is desired data,

which is designated via the interface library.

7.   A simulation apparatus for a communication

system according to claim 3, characterized in that

the scenario executing section has an executable

15   format scenario storage section which translates

a descriptive format scenario in which a sequence

for executing transmission in a desired protocol

message to the communication terminal to be evaluated

and reception in the desired protocol message from

20   the communication terminal to be evaluated has

been described, into an executable format scenario,

and which stores a translated scenario, and the

scenario executing section executes the sequence for

transmitting and receiving in the desired protocol

25   message with respect to the communication terminal to

be evaluated based on the executable format scenario

stored in the executable format scenario storage

section.

8.   A simulation apparatus for a communication
system according to claim 4, characterized in that
       the scenario executing section acquires a
reception path denoting a desired node from the message
tree of the desired receive protocol message which has
been prepared by the decode processing section, and
which relates to reception from the communication
terminal to be evaluated, acquires a value of data
of an arbitrary node denoted by the reception path
designated from among the data relating to the nodes
of the receive protocol message managed at the memory
managing section based on the reception path, reads
an expected value which has been stored in the scenario
executing section or the memory managing section in
advance, and which becomes an origin to be contrasted
for determination, and comparatively determines an
acquired value of the data of the node and a read
expected value.

9.   A simulation apparatus for a communication
system according to claim 8, characterized in that
       the first display control section causes to
display the value of the data of the node acquired
by the scenario executing section and the expected
value read by the scenario executing section so as
to correspond to each other onto the display section,
and displays a comparatively determined result by

the scenario executing section so as to be identified
as being normal or abnormal.

10.   A simulation apparatus for a communication
system according to claim 6, characterized in that

5   the encode and decode editing section

acquires a reception path denoting a desired
node from the message tree of the desired receive
protocol message which has been prepared by the
decode processing section in advance, and which relates

10   to reception from the communication terminal to be
evaluated, and acquires a value of data of a node of
the desired receive protocol message selected based
on the reception path, and

acquires a transmission path denoting a node

15   corresponding to the selected node of the desired
receive protocol message from the message tree of
the desired transmit protocol message which has been
prepared by the decode processing section in advance,
and which relates to transmission to the communication

20   terminal to be evaluated, and inserts a value of
data of the selected node of the desired receive
protocol message as a value of data of a node of the
desired transmit protocol message selected based on
the transmission path.

25   11.   A simulation apparatus for a communication
system according to claim 4, characterized in that
the decode processing section selects a desired

first node from an evaluation message tree prepared
from evaluation protocol messages to be evaluated, and
detects a second node which is a path same as a path
of the desired first node selected from the evaluation
5   message tree, from a reference message tree prepared
from reference protocol messages for being compared
with the evaluation protocol messages to be evaluated,
and

the first display control section causes to
10   display the first node selected from the evaluation
message tree and a reference message tree including
the second node detected from the reference message
tree so as to be comparable onto the display section.

12. A simulation apparatus for a communication
15   system according to claim 11, characterized in that

in accordance with an opening/closing operation
for a child tree from one message tree of the evalua-
tion message tree and the reference message tree,
opening/closing of another child tree which is same
20   as the child tree is carried out.

13. A simulation apparatus for a communication
system according to claim 11, characterized in that

the evaluation protocol message is a receive
protocol message which becomes an object to be
25   evaluated from the communication terminal to be
evaluated, and the reference protocol message
is a receive protocol message for reference in

communication by a terminal of a same type as that
of the communication terminal to be evaluated.

14. A simulation method for a communication
system, for carrying out tests for protocol messages
in communication with a communication terminal to
be evaluated by transmitting test signals to the
communication terminal to be evaluated, and receiving
response signals from the communication terminal to
be evaluated, the method comprising:

a step of preparing a definition file in
which a convention including a definition regulated
with respect to a configuration of nodes which
are information elements of the protocol messages
in communication with the communication terminal to
be evaluated has been described;

a step of preparing an interface library including
an application program interface which provides and
receives operational information with respect to the
nodes of the protocol messages to and from an exterior
section;

a step of preparing a memory managing section
which manages various data relating to the nodes of
the protocol messages;

a step of processing to decode the protocol
messages along the definition regulated in the
definition file and in accordance with the operational
information from the exterior section to the interface

library to thereby specify a data region and a value of data allocated to each node in the protocol messages, and delivering data of each node corresponding to the protocol messages to the memory managing section; and

5

a step of generating a desired protocol message by combining the data relating to the nodes of the protocol messages managed at the memory managing section, along the definition regulated in the

10 definition file and in accordance with the operational information from the exterior section to the interface library.

15. A simulation method for a communication system according to claim 14, characterized in that

15 the step of processing to decode the protocol messages has:

a step of processing to decode protocol messages input via the interface library, preparing a message tree showing a relationship of a hierarchy of each

20 node of the protocol messages based on the definition regulated in the definition file, and outputting the message tree to the memory managing section; and

a step of detecting data of an arbitrary node denoted by a path designated from among the data

25 relating to the nodes of the protocol messages managed at the memory managing section denotes based on a path denoting a node at which there is desired data, which

is designated via the interface library.

16.　A simulation method for a communication system according to claim 14, characterized by further comprising:

5　　　　a step of storing an executable format scenario in which a sequence for executing transmission in a desired protocol message to the communication terminal to be evaluated and reception in the desired protocol message from the communication terminal to be evaluated

10　　　has been described;

a step of enabling to output at least a receive protocol message received from the communication terminal to be evaluated to the interface library, by executing the executable format scenario in accordance

15　　　with the sequence described in the executable format scenario;

a step of preparing a trace data managing section which manages the sequence of the desired protocol message executed in the step of executing the scenario;

20　　　and

a step of carrying out a first display control for causing to display the sequence of the desired protocol message managed at the trace data managing section onto a display section.

25　　　17.　A simulation method for a communication system according to claim 16, characterized in that

the step of processing to decode the protocol

messages has:

a step of processing to decode the receive

protocol message input via the interface library,

preparing a message tree showing a relationship of

5   a hierarchy of each node of the receive protocol

message based on the definition regulated in the

definition file, and outputting the message tree

to the memory managing section; and

a step of detecting data of an arbitrary node

10   denoted by a path designated from among the data

relating to the nodes of the receive protocol message

managed at the memory managing section based on a path

denoting a node at which there is desired data, which

is designated via the interface library.

15   18. A simulation method for a communication

system according to claim 14, characterized by further

comprising:

a step of preparing a user interface to receive

an editing operation in each section of node of a

20   desired protocol message via the interface library;

a step of editing to encode and decode the desired

protocol message based on the editing operations

received at the user interface;

a step of carrying out a second display control

25   for causing to display onto the display section

contents of the editing operation in each section of

node of the desired protocol message received by the

user interface in the step of editing to encode and decode; and

a step of preparing a descriptive format scenario storage section which stores a descriptive format scenario in which a sequence for transmitting and receiving the desired protocol message edited in the step of editing to encode and decode has been described.

19. A simulation method for a communication system according to claim 18, characterized in that

the step of processing to decode the protocol messages has:

a step of processing to decode the desired protocol message, preparing a message tree showing a relationship of a hierarchy of each node of the desired protocol message based on the definition regulated in the definition file, and causing to display the message tree onto the display section via the step of carrying out a second display control;

a step of outputting the message tree to the memory managing section; and

a step of detecting data of an arbitrary node denoted by a path designated from among the data relating to the nodes of the desired protocol message managed at the memory managing section based on a path denoting a node at which there is desired data, which is designated via the interface library.

20. A simulation method for a communication system according to claim 16, characterized in that

the step of executing a scenario has:

a step of preparing an executable format scenario storage section which translates a descriptive format scenario in which a sequence for executing transmission in a desired protocol message to the communication terminal to be evaluated and reception in the desired protocol message from the communication terminal to be evaluated has been described, into an executable format scenario, and which stores a translated scenario, and

a step of executing the sequence for transmitting and receiving in the desired protocol message with respect to the communication terminal to be evaluated based on the executable format scenario stored in the executable format scenario storage section.

21. A simulation method for a communication system according to claim 17, characterized in that

the step of executing a scenario has:

a step of acquiring the reception path denoting a desired node from the message tree of the desired receive protocol message which has been prepared by the step of processing to decode, and which relates to reception from the communication terminal to be evaluated;

a step of acquiring a value of data of an arbitrary node denoted by the reception path designated

from among the data relating to the nodes of the receive protocol message managed at the memory managing section denotes based on the reception path acquired by the step of acquiring the reception path;

5   a step of reading an expected value which has been stored in the executable format scenario executing storage section or the memory managing section in advance, and which becomes an origin to be contrasted for determination; and

10   a step of comparatively determining an acquired value of the data of the node and a read expected value.

22.   A simulation method for a communication system according to claim 21, characterized in that

15   the step of carrying out a first display control has:

a step of causing to display the value of the data of the node acquired by the step of executing the scenario and the expected value read by the step

20 of executing the scenario so as to correspond to each other onto the display section; and

a step of causing to display a comparatively determined result by the step of executing the scenario so as to be identified as being normal or abnormal.

25   23.   A simulation method for a communication system according to claim 19, characterized in that

the step of editing to encode and decode has:

a step of acquiring the reception path denoting
a desired node from the message tree of the desired
receive protocol message which has been prepared in
advance by the step of processing to decode, and which

5   relates to reception from the communication terminal
to be evaluated;

a step of acquiring a value of data of a node of
the desired receive protocol message selected based
on the reception path acquired by the step of acquiring

10   the reception path;

a step of acquiring a transmission path denoting
a node corresponding to the selected node of the
desired receive protocol message from a message tree
of a desired transmit protocol message which has

15   been prepared in advance by the step of processing
to decode, and which relates to transmission to the
communication terminal to be evaluated; and

a step of inserting a value of data of the
selected node of the desired receive protocol message

20   as a value of data of the node of the desired receive
protocol message selected based on the transmission
path acquired by the step of acquiring the transmission
path.

24.   A simulation method for a communication

25   system according to claim 17, characterized in that
the step of processing to decode has:
a step of selecting a desired first node from

an evaluation message tree prepared from evaluation

protocol messages to be evaluated; and

a step of detecting a second node which is a path

same as the path of the desired first node selected

5   from the evaluation message tree, from a reference

message tree prepared from reference protocol messages

for being compared with the evaluation protocol

messages to be evaluated, and

the step of carrying out a first display control

10   has:

a step of causing to display the first node

selected from the evaluation message tree and a

reference message tree including the second node

selected from the reference message tree so as to

15   be compared onto the display section.

25. A simulation method for a communication

system according to claim 22, characterized in that

in accordance with an opening/closing operation

for a child tree from one message tree of the evalua-

20   tion message tree and the reference message tree,

opening/closing of another child tree which is same

as the child tree is carried out.

26. A simulation method for a communication

system according to claim 22, characterized in that

25   the evaluation protocol message is a receive

protocol message which becomes an object to be

evaluated from the communication terminal to be

evaluated, and the reference protocol message
is a receive protocol message for reference in
communication by a terminal of a same type as that
of the communication terminal to be evaluated.